Utah Department of Transportation
Construction
Manual of Instruction
Revised July 2004

CHAPTER 2: EARTHWORK

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Clear & Grub (Refer to Standard Specification 02231)

The vegetation and debris to be cleared, grubbed, removed and disposed of under this section includes all surface objects, trees, stumps, roots and other protruding obstructions within the designed limits except such objects as are designated to remain in place or are to be removed under other contract items.

A. Preconstruction Markings

1. **Boundary Limits**
   The Resident Engineer should be sure that the limits of all areas in which the Contractor will be required to perform work are clearly marked. It should be made clear to the Contractor what access has been provided for the Contractor and for those property owners adjacent to the project.

2. **Special Details**
   The Resident Engineer should go over the job with the Contractor (or Contractor's representative) and discuss the general work to be done and any special details of the project. Such details should include land monuments, property markers, trees to be saved stakes and survey control points to be preserved, and all known utilities that could be damaged during clearing operations. General clearing and disposal of materials procedures should also be discussed.

3. **Underground Utilities**
   A careful investigation should be made to determine the location of all underground facilities within the right-of-way. This information should be in the hands of the Contractor in order that their location can be established on the ground prior to any clearing operation. There are occasions when utilities are in place within the right of way at the time the contract is awarded that are to be removed after certain construction operations are complete. The Contractor must be kept informed as to the intended time of their removal or relocation so that construction operations can be properly coordinated with the activities of the utility company involved.

B. Operations

1. **Equipment and Methods** (Refer to Standard Specification 00555)
   Use equipment of the size and mechanical condition to perform and produce the specified work. Sometimes there are limitations to the choice of equipment dictated by the specifications or common sense. The use of explosive will comply with all laws and ordinances as well as Code of Federal Regulations title 29, Part 1926 – Safety and Health

Regulations for Construction (OSHA) and Title 30 and the UDOT Construction Safety Manual, whichever is the most restrictive. (Refer to Standard Specification 00820). The methods used to clear timber in non-excavation areas may very from simple sawing a tree down to complete removal of tree, stump, and attached roots by pushing it over and pushing the stump out of the ground with a bulldozer. It is the Inspector's responsibility to see that the Contractor furnishes competent operators who will do the work correctly.

2. **Protection and Preservation of Property and Objects**
   Private or public property adjacent to the right of way, and all natural growth improvements thereon, must be continually protected from damage by the Contractor's equipment. When and where such damage is done by the Contractor's equipment and operation, it is the sole responsibility and expense of the Contractor to rebuild or make good such damage or injury. The Contractor shall select the manner in which the property shall be preserved and protected as long as it is reasonable and consistent with good construction practice. The Resident Engineer should refrain from directing how this should be accomplished, unless it is specifically covered by the plans and specifications.

   Precaution measures must be taken to protect objects designated to remain in place from damage during clearing and grubbing and other construction operations. These objects may include trees, shrubs, survey or historical markers, objects of historical or archeological value, and others. Clearly marking these objects and making the Contractor aware of their location will help in their preservation. Trees closed to the top of high cut slopes can be designated for preservation if they will not become a traffic hazard or threaten the stability of the slopes.

3. **Removal of Trees, Undergrowth, Stumps and Roots in Excavation Areas**
   Trees, stumps, and large roots should be removed from excavation areas to a depth of 0.6 meters below natural ground, to prevent such objectionable material from becoming mixed with the material being incorporated in the embankment. Refer to Standard Specification 02231 for special conditions. These areas to be excavated will normally require stripping to remove and dispose of small bushes, vegetation, rubbish and other objectionable material.

4. **Disposal of Materials**

   a) **Merchantable Timber:**
      Timber to be removed from the construction area may be, all or in part, of merchantable quality. Where required by the plans and/or specification to be disposed of as saw logs, the timber should be

trimmed of all limbs and cut into log lengths. It is then either stacked out of the construction area or disposed of as directed by the governing specification. In many cases the timber of merchantable quality is not distinguished from other timber and becomes the property of the Contractor when so designated on the plans.

b) Burning of Timber

Prohibited along highway rights-of-way without approval order from the Executive Secretary of the Utah Division of Air Quality.

c) Disposal of Material Outside the Right of Way.

The Contractor may elect to dispose of all or part of the clearing debris outside of the right of way. This is usually permitted if the Contractor has written permission from the owner of the land in which disposal is made. The Resident Engineer should examine the proposed disposal area. A determination should be made that the disposal area will not present an unsightly appearance from the highway, block natural drainage to or from the highway, or create the possibility of sliding into the right of way and create a maintenance problem.

Remove Structure and Obstruction

Building, foundations, structures, fences and other obstructions within the right of way, which are not designated to remain, must be removed and disposed of in accordance with the Standard Specifications. All salvageable materials designated to remain the property of the State are to be removed carefully and stored in accordance with the special provisions. Foundations are to be removed to the designated depth and basement floors are to be broken to provide drainage of water. Basements, septic tanks, are cavities left by their removal must be backfilled as specified, and if the areas are within the roadway prism; care is to be taken to see that the backfill is properly compacted. Care should be taken to see that pavements or other objects, which are to remain, are not damaged during this operation.

During the work involved in removal of structures and obstructions, the exercise of good judgment is of paramount importance. The orderly sequence of work will reduce construction and engineering costs. Right of way documents and plans should be referred to continually to prevent damage and trespass. Only adequately trained personnel should be permitted to inspect this type of work because of the legal implications. Good communication between all involved parties is required.

The Contractor must obtain the licenses necessary for this type of operation. Generally the license has stipulations concerning the underground utilities.

Site Demolition Refer to Standard Specification 02222

Careful planning of the work may eliminate all or part of this item for a given contract. Whenever part of this item is included in another work item, documentation is required in field books to avoid double payments.

Dust Control and Watering Refer to Standard Specification 01572

This item consists of furnishing and applying water for the wetting or prewetting of embankment materials, base courses, gravel surface courses, subgrade, dust control, haul-road and detour maintenance as may be required in the specifications or as directed by the Resident Engineer.

The Contractor shall make all necessary arrangements for obtaining water. The Contractor shall provide an adequate water supply at all times. Water must be free of dirt, silt, or other detrimental matter.

A cooperative agreement between users and protectors of the water within the Colorado Rive basin drainage effects all Department projects in the area. A requirement of a fee based on hectares-meters of water used for any purpose is to be paid to the USFWS (United States Fish & Wildlife Service) as custodian of the water resource for depletion of water.

Water shall be applied at locations determined by the Resident Engineer. The water may be hauled in tanks or applied by a pipeline system. Water added during finishing operations shall be uniformly applied.

Equipment used for dust control and finishing operations of subgrade and surfaces shall be adequately powered and equipped with a pressure pump. Adjustable spray heads, front or rear and spray bar shall provide uniform and controlled application of water without creating a pond or washing. Positive control of water from the driver's position is required.

Roadway Excavation

A. Description

Roadway excavation is that material obtained from within the right-of-way exclusive of channel and structure excavation. It may be composed of common soil, solid rock, loose rock or any combination of these materials. Saturated or unsaturated mixtures of soil and/or organic matter not suitable for foundation material shall be removed and disposed of properly. When there is insufficient roadway excavation, together with suitable excess channel and structure excavation, to complete the embankment to the required line and grade (i.e., the "cut" and "fill" do not balance) then borrow must be imported to make up the difference. Embankment removal, construction and compaction of earthwork are included in the price of roadway excavation.

B. Construction Requirements

1. Soil Examination

The Resident Engineer should examine each newly exposed cut as soon as possible after it is opened in order that necessary changes may be made before excavating equipment has been moved away. This will necessitate an inspection of the cut slopes and the ditch cuts to locate any objectionable or unstable foundation materials or faulty drainage conditions that need correction. A visual inspection should be made of the subgrade in order to determine if objectionable materials are present. Objectionable materials are those having characteristics, which may cause an unstable subgrade. Among the conditions for which the Resident Engineer must watch the soil moisture contents, which are so high as to render the subgrade unstable under the designed surfacing, high water table and soils in which frost heaving may be serious, such as silts and very fine sands having high capillarity. In the event such conditions are discovered, the Resident Engineer should contact the Region Construction or Materials Engineer for assistance in making corrections to the condition

2. Protection of Property

This is a continuation of those practices initiated during the phase of right-of-way preparation and acquisition. Movement of equipment will be less restricted during excavation and the subsequent embankment construction, because the right-of-way has been cleared and grubbed. However, utilities (both above and below ground) trees to be preserved, survey control points, etc., must be protected during this operation. Private property adjacent to the right-of-way must be protected from damage by the Contractor’s equipment. Prior to beginning this operation, it is advisable to again emphasize protection of property to the Contractor.

3. Blasting

Blasting operations should leave the "cut" area at the correct line and grade. The spacing and depth of drill hole, the explosive type and loading sequence, the method of firing, and related matters are conditions to be satisfied by blasting experts. Each of these is dependent upon local rock conditions and the construction equipment to be used. Good blasting technique can lower the Contractor's cost while producing specification material under relatively safe conditions. Poor blasting by unqualified personnel is dangerous, and it can cause excess overbreak or fail to shatter the material enough for economical handling and placement. Blasting information is to be provided to the Resident Engineer prior to any blasting occurring on the project.
The spacing and strength of the blasting charges should be such that the actual blast is as light as possible consistent with thorough rock

breakage and reduction in size for economical hauling and placement. Overshooting is very undesirable. It can produce rock fractures beyond the intended line and grade that result in jagged slopes, uneven ditch grades, and possible future slides in the slope areas. Overshooting can also produce the immediate problem of fly rock. Special care should be used in the blasting of material adjacent to proposed slopes or ditch lines. In deep cuts through difficult material where slope smoothness is hard to obtain, it can be advantageous to drill slope holes parallel to the proposed slope. In these "sloped" holes, the charge is distributed along the length of the hole instead of placing all of it at the bottom, and then exploded simultaneously. This "presplitting" is not intended to loosen and break up a great amount of rock, but to shear a reasonable smooth plane along the proposed slope face. The rest of the rock in the cut is then shot and removed in a manner best suited to the materials involved.

4. Overbreak

Overbreak is that portion of the material, which is excavated and displaced or loosened outside of and beyond the slopes or grade as staked or re-established. Excepting such material, which occurs as slides, regardless of whether any such overbreak is due to blasting, to the inherent character of any formation encountered or to any other cause. All over-break shall be removed by the Contractor at their expense, expect as hereinafter described.

Overbreak should not be paid for in any manner except when the roadway excavation included in the proposal is not sufficient to complete the embankment. With the approval of the Resident Engineer overbreak material may be used to complete the embankment and payment made at the contract unit price for the Roadway Excavation. Overbreak material may be used in forming embankment that were originally planned to be constructed with borrow excavation if approved by the Resident Engineer.

In the event that conditions causing the overbreak justify re-establishing the slopes to include part or all of the overbreak section, the material reverts to roadway excavation material and is paid for as such. Justifiable reasons for re-establishing the slopes may be uncontrollable overbreak resulting from the existence of natural cleavage or faults in rock formations or planned slopes resulting in an unsafe and unstable condition. When a question occurs as to justification for re-establishing slopes because of overbreak, the Resident Engineer should consult with the Region Construction Engineer.

5. Grade Points

Many times roughness in the base and surface courses of a roadbed appears at the junction of sizeable excavation and embankment section. In all probability this is the result of a lack of attention to importance of embankment foundation preparation in these critical areas. The situation is comparable to the junction of a side hill excavation and its laterally adjacent embankment. Under these conditions “steps” are cut into the existing ground slope as each succeeding lift of embankment is placed. This stepped area, compacted with a layer of embankment is then covered with the next lift of loose embankment material. Then as a result of the manipulation and compaction that follows, this embankment lift is “keyed” into the adjacent natural ground. This procedure with the steps cut an angle to the road centerline that is perpendicular to the ground slope will be advantageous in reducing subsurface movement where these grade points occur. STD DWG 815-1 can be downloaded through folio or UDOT’s Home Page in a dfx format.

Excavate for Structure

This item consist of the excavation and backfill or disposal of